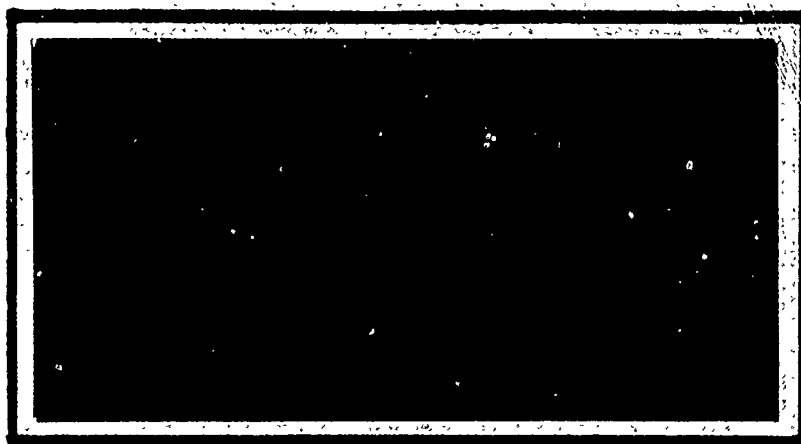②

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IMPLEMENTING SELF-MANAGING WORK TEAMS
IN A HIGH PERFORMANCE
WORK ENVIRONMENT

THESIS

Gerald L. Page, Captain, USAF

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IMPLEMENTING SELF-MANAGING WORK TEAMS IN A

HIGH PERFORMANCE WORK ENVIRONMENT

THESIS

Presented to the Faculty of the School of Systems

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Master of Science in Logistics Management

Gerald L. Page

Captain, USAF

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Abstract

Many organizations today are continually trying to find ways to increase productivity and to decrease costs. As a result, many businesses are turning to Total Quality Management (TQM) as a means of achieving these goals.

This research is a study of self-managing work teams, an aspect of TQM. A case study approach was chosen.

The case study was not carried through to completion of the design effort due to time constraints. However, from the data gathered and knowledge gained from the literature review, it appears that the teams are already helping increase productivity in the company studied.

Significant factors in successful implementation of this concept include 1) full commitment and support from management, 2) good lines of communication between line workers, management, and the union, 3) union participation in the design process, 4) a solid organizational structure for the design team, and 5) proper education and training for the employees.

Recommendations for further research include 1) carry this case study through to completion, 2) analyze the differences the teams made, and 3) conduct more longitudinal studies in this field.

IMPLEMENTING SELF-MANAGING WORK TEAMS IN A
HIGH PERFORMANCE WORK ENVIRONMENT

I. Introduction

Background

Many organizations today are continually trying to find ways to increase productivity and decrease the costs of conducting business. The United States Air Force is one of these organizations—its business being the defense of the United States. Even though the military is not a profit-driven organization, it operates under a limited budget and must conserve its resources as much as possible. One way some companies, along with the Air Force, other Department of Defense organizations, and several other government agencies are decreasing costs is by putting greater emphasis on total quality management (TQM).

Strong interest in many of the aspects of TQM, such as quality circles, began in the mid to late 1970s. This was partially in response to what was widely thought to be the large role these aspects played in the success of Japanese organizations (16:40).

To better compete in world markets, other management change efforts, such as Just-in-time systems, total quality control, robotics, and gainsharing were designed and implemented in many organizations. Concerning these

developments, Dr. Michael Donovan, president of Productivity

Systems, Inc., suggests:

> Each of these innovations has contributed to
> improving some aspect of overall performance in
> many organizations. However, these programs are
> often not well integrated with each other or with
> other processes and systems within individual
> organizations. They each focus on only one aspect
> of the total system... (9:58)

In support of this statement, one manager writes that

members of quality circles tend to use their creativity for

only one hour a week, then turn back into stereotypical

employees (20:47). Also, an Army study states that "In

general, little attitudinal change has been documented as a

result of quality circles" (23:5).

Overall, there seems to be a call for more

comprehensive employee involvement in organizations. This

involvement "...must be dominate and that a company-wide

continuous improvement be sustained by a positive work

environment" (28:40).

General Issue

An aspect of TQM that shows great promise in achieving

reduced costs and better mission accomplishment is the

concept of self-managing work teams. Self-managing work

teams are sometimes referred to as work teams, self-

regulated work groups, autonomous work groups, or semi-

autonomous work groups. As the names imply, they represent

varying degrees of participatory management (22:62). There

are a number of reasons why increasing numbers of companies

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are incorporating this style of management into their operations. According to Gershenfeld and Napier:

> The current high level of employee dissatisfaction and the decline in worker productivity have given additional impetus to the acceptance of a participative management philosophy...worker dissatisfaction, apathy, and alienation, all critical factors in the current productivity slump, have been associated with increased task specialization of work and increased bureaucratization of organizations. (12:526)

In 1983, the United States Navy implemented work teams in the Pump Repair Shop at the Navy Shore Intermediate Maintenance Activity (SIMA) in San Diego, California. "Productivity, adjusted for changes in manning levels, increased 40 percent" (11:1).

The United States Army also initiated their own version of a self-managing work team, called the Work Environment Improvement Team at Fort Ord, California. This team is comprised of "...ordinary soldiers, who not only identify problems in their work environment but also analyze and seek solutions to those problems" (23:6).

In 1988, the United States Postal Service and the National Association of Letter Carriers issued a vision statement on how employee involvement will become incorporated into the way each work unit functions. The thrust of the statement was to create an environment where: "...creativity is encouraged, where each person takes responsibility for his or her own work and that of the unit, and a mood of pride and respect prevails" (17:66).

Perhaps the most ambitious TQM effort that uses self-managing work teams being carried out by a government agency is the PACER SHARE demonstration project. PACER SHARE is a five-year work demonstration project being conducted at the Sacramento Air Logistics Center, Maclellan Air Force Base, California "to waive Federal Civil Service Regulations on an experimental basis to determine whether the changes improve such factors as productivity and the quality of working life (24:1)."

More and more profit-driven companies are also transitioning to the concept of self-managing work teams. One of the first to implement this management philosophy is W.L. Gore and Associates. Gore is the manufacturer of Gore-Tex fabric, vascular grafting material, and many other related products. They carry the strategy of "un-management" to the extreme. According to Bill Gore, founder of the company:

> The company nurtures and markets innovation
> through a unique corporate culture, the lattice
> structure, where un-management is the guiding
> principle. Any associate is free to approach
> another: There is no hierarchy. (31:14)

"Each associate has total freedom to take on any work, and total responsibility for the work they do" (31:15). This management style seems to work, because "...the profit per associate is double and the creativity, the number of patent applications and innovative products, is triple that of Dupont" (31:14).

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A good example of how teams can turn an organization around is the NUMMI automobile assembly plant in California. In 1985, a closed General Motors factory was reopened as a joint venture with Toyota Motors Corporation. This plant is now hailed as proof that a labor and management success story can be created in American heavy industry. Union leaders and management are pleased with the way the teams in the organization are performing.

The teams consist of four to eight people with one member as team leader who gets paid 50 cents an hour more than the other members. The team leader handles administrative duties, fills in for absen workers, and helps those having trouble finish their work. Overall, the teams are given more say in their jobs resulting in higher levels of job satisfaction and productivity.

Underlying the change to self-managed work teams was a change of management philosophy. The lines of demarcation between management and workers are not very clear. For example, there are no special parking or dining privileges at the plant. Senior executives and workers all wear the same uniform, park in the same lots, and eat in the same cafeteria (19:22-23).

Problem Statement

A commonly made mistake to correct deficiencies in organizational structure is to put temporary fixes on problems when an entire new corporate philosophy is required

(9:58-59). One possible permanent correction to lack of productivity is to implement self-managing work teams in organizations.

This thesis will research whether the concept of self-managing work teams is a viable style of management that can be used in industry to reduce costs and help organizations reach their goals. The question will be asked in two parts. First, is it feasible to implement self-managing work teams throughout industry? Second, what impact does changing to this management concept have on the cost and quality of goal attainment?

Investigative Questions

In order to answer the research questions posed above, organizations that have implemented, or plan to implement self-managing work teams will be examined to investigate the following questions:

1. Why did the organization decide to implement self-managing work teams?

2. To what extent is this concept implemented?

3. What are the necessary steps taken in order to successfully implement self-managing work teams?

4. What change in productivity is expected, or has been experienced, since implementation?

5. In what ways do self-managing work teams affect the internal structure of the organization?

6. How are the people of the organization adapting to this concept of management?

7. What are the lessons learned from implementing self-managing work teams?

8. What barriers to implementing self-managing work teams were encountered?

Limitations

It may not be possible to generalize the results of this research to all areas of industry and all types of companies. Implementing this management style requires restructuring an entire management philosophy (9:59). Because of the nature of the military mission and its command-oriented management, the use of self-managing work teams in the USAF and other DoD organizations may only be an appropriate alternative for certain tasks.

Definition of Terms

For clarity of this research, several terms must be defined. They are as follows:

Total Quality Management - Although all of the literature in this study pertains to the principles of total quality management, no specific definitions of the term have been uncovered. For the purpose of this text, the researchers definition, based on the compiled literature is as follows:

Total quality management is the comprehensive concept of increasing the productivity and quality of the work environment by using all sociotechnical means possible. The term sociotechnical refers to both the technical

(technological and procedural) and social (behavioral) components of an organization (23:6; 13:9-10; 9:58-60; 17:68).

Quality Circles - These are groups of (usually) five to ten workers who perform similar jobs and meet to resolve problems that concern the quality of production or service in an organization (16:41). These groups normally meet once a week for about an hour (20:47).

Quality circles are defined because self-managing work teams use the principles of the quality circle and make them an integral part of the corporate philosophy.

Self-Managing Work Teams - A concise definition of this concept is difficult to extract from a single source. A better definition is obtained by combining several authors' interpretations. Self-managing work teams are self-contained units that not only perform the tasks associated with their jobs, but also take the responsibility for the job and the members of the team. This responsibility includes planning, executing, and continually trying to improve the way the job gets done (9:60; 16:41; 12:526-28).

Summary

This chapter presented a brief discussion of the increasing need for TQM to help cut costs and increase productivity. Some of the shortcomings of previously implemented aspects of TQM were then mentioned. Next, the concept of self-managing work teams was submitted as a

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possible alternative management style to achieve reduced costs and increased productivity. Examples of both profit and non-profit driven organizations that successfully implemented this concept were given to support the alternative. Key terms were defined and the research question "Is self-managing work teams a viable style of management in industry?" was posed. Limitations to the research were then offered and investigative questions were put forth to answer the research question.

II. Review of Literature

Overview

This chapter will accomplish several goals. First, the conceptual framework of sociotechnical system design will be presented in a form applicable to a high-performance organization. This examination will give insight into the criteria necessary for an organization to successfully implement high-performance management practices like self-managing work teams. Attention will be paid to the management philosophy behind transforming the organization and aspects of organizational and job design. Also, some different views of the steps necessary to implement the teams will be reviewed.

Sociotechnical Design of Organizations

Overview. Researching the literature on organizational change, two broad categories of approaches to enhancing productivity are identified. The first category focuses on the human or social side of the organization. The second focuses on the organization's technology and structure used to accomplish the work (11:2). Feher and Levine term the second approach as "technostructural". The technostructural approach aims at intervening in or changing work content, methods, and structured relationships among workers to improve organizational performance (11:2). This

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intervention can involve changes in job design or sociotechnical system design (26:460).

The focus of job design is at the level of the individual performing his task. Efforts to enrich the job include control over resources, accountability, feedback, work pace, achievement opportunities, and personal growth and development (5:169). Hackman and Oldham's job characteristics model states that job design attempts to enhance motivation by adding more variety, challenge, responsibility, and feedback to a job (5:169-74).

In contrast to job design, sociotechnical system design is at the level of the work system. According to Louis E. Davis, who co-developed, with Eric Trist the first graduate program in sociotechnical systems at UCLA, the technology used by the organization is considered to be an operant variable and can be altered to best fit the needs of a specific social system (7:270). Thus, sociotechnical interventions are broader in scope and constitute organization redesign (8:5).

Sociotechnical Systems Theory. The term "sociotechnical system" was coined by Eric Trist in 1951 in his study of coal mines in Great Britain. He used it to describe a method of viewing organizations which emphasizes the interrelatedness of social and technical systems within the organization. He further describes the organization as an open system because of its interdependent relationship with the external environment. The relationship is in terms

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of inputs of raw materials and resources and outputs of finished goods. Also included is the resultant feedback loop which enables the cycle of activities to continue (11:3; 36:13-15; 27:1182). This interdependency is the first of two important features of sociotechnical systems theory.

The second important feature is joint optimization. Joint optimization of both the social and technical systems is the theoretical goal of sociotechnical system design (11:3). According to Feher and Levine in their study of the pump repair shop at the Navy SIMA in San Diego:

> The importance of joint optimization is based on the postulation that optimal organizational performance will be attained when the social and technical systems of the organizational unit are designed to fit the demands of each other and the unit's environment. (11:3)

Included in this feature is the fact that technology is not accepted as a given. Joint optimization assumes that several alternative arrangements of people and technology may be used to accomplish the same organizational goal (27:1182).

Joint optimization can be better understood by taking a closer look at the social and technical systems in organizations. Feher and Levine state that the social system of an organization is comprised of the people who work in the organization and the relationships among them. These can be examined at both the individual and organizational levels. At the individual level, people

bring their expectations, needs, values, and attitudes to the organization. At the organizational level, the people function in a network of roles to achieve the goals of the organization and maintain its viability over time (11:3). As Pasmore, Francis, Haldeman, and Shani contend, the challenge of sociotechnical system design is "identifying the needs that people bring with them to the work place, and incorporating means of meeting those needs through the design of the technology and work itself." They also maintain that this approach "is the surest way of directing the efforts of organizational members toward organizational goals (27:1183)." Trist supports this view. He states that:

> Employees who have convincing evidence that their organization has committed itself-long term-to joint optimization are more likely to commit themselves [to the organization's goals] than those who do not. (36:32)

The technical system of an organization consists of the tools, techniques, procedures, skill and knowledge used by members of the social system to accomplish organizational goals (11:4). Choices made in technical system design at both the individual and organizational levels affect the social system by shaping the attitudes and behaviors of individuals operating within it. According to Feher and Levine, at the individual level, the design of jobs either helps or hinders workers' skill development and learning through opportunities made available for variety, challenge, and discretion in the immediate work environment. At the

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organizational level, superior-subordinate roles are
arranged by the mechanisms of coordination and decision-
making required to integrate activities, thereby allocating
opportunities for authority, responsibility, and
accountability among organization members (11:4).

Recognizing the importance of the technical system,
Pasmore contends that this area is often neglected in
sociotechnical system design. He states that:

> It is the contention of sociotechnical system
> theorists that organizational designers constrain
> themselves unnecessarily in the choices that they
> make regarding the technological systems, and tend
> to overlook opportunities to redesign technologies
> to meet the needs of people. Nevertheless,
> ...relatively few sociotechnical experiments
> actually involve technological changes; instead,
> most concentrate on rearranging the social system
> around an existing technology in order to
> approximate joint optimization. (27:1185)

According to A. B. Cherns, the intent of joint
optimization is to realize the full potential of the
organizations's resources in accomplishing the mission.
This is accomplished in sociotechnical organization design
by control of key throughput variance (2:313). Variance
refers to any deviation from expected output that is not
planned for. Trist states that "a variance is key if it
significantly affects (1) either the quantity or quality of
production, and (2) either the operating or social costs of
production" (36:33). This may be a variation in the quality
of a raw material, the failure of an individual to take
action at a critical time, the failure of a machine, or

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other variations in throughput affecting the accomplishment of goals (27:1187).

These variances can be further compounded when they occur in a series of dependent events. Eliyahu Goldratt treats this phenomenon extensively in The Goal. He uses the phrase "statistical fluctuations of dependent events" to describe it (15:86-7). The idea is that nearly every process has some amount of variance in process time, product quality, etc. In most organizations, overall throughput depends on a series of processes that must all be completed before the product is finished. Further, the processes are normally in some set order--process A must be completed before process B can begin, B before C, and so forth. Goldratt submits that if each of these processes have some sort of variance or fluctuation, the effects on overall throughput are additive. In other words, total throughput for the organization will have a variance greater than that of any one of the processes (15:99-111).

One of the main thrusts of sociotechnical design, then, is to establish appropriate boundaries to control key variances. Feher and Levine cite Miller's discussion where he states sociotechnical theory dictates that organization boundaries be drawn so that the work-related activities and roles of the members within the unit can be carried out in a manner which enables that unit to be self-managing in regard to controlling key variances. When the boundaries are not

drawn correctly, other subsystems in the organization can interfere with the unit's capacity to regulate itself (11:4).

Principles of Sociotechnical Design. Cherns maintains that many choices are available in the design of organizations. He says that historically, organizational design has been performed as an engineering function. Those doing the designing focusing on technical aspects such as space, tools, equipment and machinery, and allocating tasks to individuals or groups as though they were merely extensions of the equipment. He goes on to state that layers of supervision are then generated to integrate the activities that become fractioned during the design process (2:310).

The result of this type of design is that there is little, if any, attention paid to the social system. Feher and Levine state that, at the individual level:

> No attention is paid to whether or not the work provides adequate variety, challenge, and learning to engender motivation, concern for quality, and commitment to the organization's goals. (11:4)

At the organizational level, there are no reviews conducted to ensure that the members of the unit are playing roles which foster responsibility, good decision-making, and the desire to be judged by one's worth. Realizing that organizational designers must incorporate the social as well as technical aspects of the unit into the design, Cherns derived nine principles from the available literature to

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give insight into how this could be accomplished (2:310-11).
These nine principles, extracted from Cherns article, are as
follows (2:311-20):

1. *Compatibility* - Essentially, compatibility requires
that the means to organizational design or redesign be
consistent with the end result. According to Cherns, the
goals of redesign are to improve the unit's effectiveness,
fully use all the people, add greater flexibility to its
functioning, and make it more adaptable to changes (2:312).
To achieve these goals, commitment is required from the
members. Commitment can be achieved by designing the
organization to function in a more participatory manner.
Increased involvement not only inspires commitment to the
organization, it enables them to incorporate their
experience and insights into the design.

2. *Minimum Critical Specification* - This principle
states that only the minimum amount of behavior should be
dictated to the people of an organization. Individuals and
groups need to know what goals they are expected to
accomplish and the standards of performance that is expected
of them. Everyone should also have access to the tools, raw
materials, training, and equipment they need in order to
complete their tasks and meet standards. Beyond this,
members should be given as much autonomy and responsibility
as possible in doing their jobs.

3. *The Sociotechnical Criterion* - The sociotechnical
criterion deals with the control of key variances. Control

of variances in an organization has historically been a function of management and a quality control unit. Under sociotechnical design, this control should be maintained as close to its occurrence as possible, preferably at the work center itself. Cherns states that training individuals to control variances has two important advantages to the organization. The first is it builds a feedback loop into the work itself. Individuals who receive immediate feedback can learn to correct the sources of variance in their work. Second, it upgrades the skills of members as they learn to monitor and take responsibility for their work (2:313-14).

4. *Multifunctional Principle* - Rather than have the people of a unit perform a single task that is broken down into its most basic components, the work should be assigned in such a way so that multiskilled workers are developed. This not only gives greater variety, challenge, and learning opportunities to the individual worker, but also makes the organization more flexible in its functioning. The organization becomes less vulnerable to the consequences of absenteeism turnover of personnel.

According to Feher and Levine, one way to develop multiskilled people is to have them work in groups that are responsible for the accomplishment of a whole product or goal. Individuals within the group will learn by exposure to the various skills of the other members. The skills cultivated by participation in the group breeds individual's

pride in their increased base of knowledge which, in turn, contributes to the overall effectiveness of the organization (11:6).

5. *Boundary Location* - Organizational boundaries are usually one of the results of the design process. In sociotechnical design, this principle asserts that the boundaries in organizations should be drawn so that the people in each unit have. possession and control over the information, authority, and personnel skills, as well as other factors, needed to accomplish their mission.

6. *Information Flow* - Information must flow downward beyond the line supervisor level to where the work is actually accomplished. Accurate, timely feedback is required for workers to monitor their own performance and control key variances at the source. Again, this contributes to attainment of goals of the entire organization.

7. *Support Congruence* - Organizational support systems should reinforce the behaviors which the organization structure is designed to elicit and the underlying management philosophy. These systems such as member selection, training, conflict resolution, leave allocation, and reward systems should be congruent with the overall system design. For example, if the design is based on group performance, rewards should be made at the group level, not to individuals.

8. *Design and Human Values* - One objective of organization design should be to provide jobs that meet a person's work related social and psychological needs. These "good jobs" are described by Trist as having six characteristics (36:29-30). These characteristics are:

   a. Content reasonably demanding in terms other than sheer endurance and yet providing some variety.

   b. Opportunity to learn on the job and to go on learning .

   c. Opportunity for some decision-making the individual can call his or her own.

   d. Opportunity for some degree of social support and recognition.

   e. Opportunity to relate what one does and produces to the needs of society.

   f. Occasion to feel that the job leads to some sort of desirable future. This does not necessarily mean promotion.

9. *Incompletion* - This principle states that organization design is an on-going process. It recognizes that the environment in which the organization operates is not static but changes over time. The design must be flexible enough to adapt to environmental changes. Redesign, then, should become part of the organization's every day functioning.

   The Process of Sociotechnical Design. In order to properly implement sociotechnical designs, one must have a way to analyze the work system to identify problem areas, analyze how the system functions, and generate alternatives for the organization to achieve its goals (11:8; 36:33).

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Trist and Feher and Levine both present a nine-step model developed to accomplish this task (11:8-10; 36:33). The model, synopsized from these sources, follows.

The first step is termed *environmental scanning*. Here, an initial scanning is made of all the main aspects, both technical and social, of the selected target system. This can be either a department or an entire plant to be studied (36:33). The focus is to determine problems of integration or coordination and where subsequent analysis should be directed (11:8).

The next two steps constitute the analysis of the organization's technical system. The first of these steps is the *identification of unit operations*. Davis states that:

> Unit operations are...the main segments or phases
> in the series of operations which have to be
> carried out to convert the materials at the input
> end of the system into products at the output end.
> Each unit operation is relatively self-contained
> and effects an identifiable transformation in the
> raw material. (8:1)

By transformation, Davis means any change of state, location, or storage of the material.

The other step in the technical analysis is the *identification of key process variances*. As discussed earlier, variance is any unwanted discrepancy between a specification or desired state and an actual state (29:2.5.18). Key variances significantly affect production, operating, and/or social costs (11:9). Davis and Wacker present an elaborate method of variance analysis in the

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Handbook of Industrial Engineering (29:2.5.17-2.5.21). The
purpose is to identify unit operations where a deviation
from standards significantly affects desired end results.
Once the key variances have been identified, ways to control
them can be generated. According to Feher and Levine, key
variances are largely controlled by people performing roles
in the social system of an organization (11:9).

The fourth and fifth steps in the system analysis focus
on the social system functioning. In step four, *macro
social system analysis* is conducted to investigate the
extent to which the present functioning of the social system
aids the workers' capacity to control key variances at their
point of origin. This analysis should identify any new
organizational relationships or informational loops may be
needed in order to accomplish key variance control (11:9).

Next, a separate inquiry is made into the *workers'
perception of their roles* in the organization. This
includes whether or not workers perceive their roles as
being responsible ones that foster commitment and fulfill
psychological needs (36:33; 6:4).

Step six is *analysis of the maintenance system*. This
focuses on the relationship between the equipment
maintenance system and the work system being looked at. It
is not an in-depth investigation of the organization's
internal operations. Rather, the analysis identifies the
extent to which the maintenance system affects the
capability of the work system to achieve its objectives. To

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do this, Feher and Levine state that maintenance-related variances must be identified and the boundaries of operations that cross functional lines (e.g., repair versus maintenance) and their control mechanisms must be evaluated. Determinations can then be made whether or not improvements can be made by incorporating some maintenance functions into work system roles (11:10).

After maintenance system analysis, an *investigation of supply, staff, and user systems* is conducted. This is done in much the same way as the in the previous step, but the purpose is to identify the extent to which these systems affect the capability of the work system under study to achieve its objectives. Again, a key focus of these analyses is on the appropriateness of boundaries that cross functional lines.

Step eight is labeled *future scanning*. Since all organizations must, at some point in time, change to meet changes in the market, the work system must be prepared for change (11:10). As much information as possible should be gathered about intended changes and incorporated into the new work system design. Davis identifies two specific areas that should be scanned. The first is the development plans for the technical and social systems of the organization. The second is any planned alterations in general structure or policies of the organization that may have some affect on the technical or social systems (8:7).

The final step in the design process is to *develop a proposal for change* which systematically addresses the problems and issues raised in the previous steps. According to Feher and Levine as well as Trist, this consists of gathering together all of the proposals and hypothesis generated during the work system analysis and considering their viability in terms of the production and social objectives of the organization. They should then be presented with sufficient structure and information to form the basis for an organizational change program (11:10; 36:33).

Implementing Self-Managing Work Teams

Now that the conceptual framework for implementing change in an organization has been laid, some of the specific steps to implement self-managing work teams will be presented. Most of the authors have their own philosophy on which steps must be taken for successful transformation to this management style. The literature on this subject was consolidated into a single "roadmap" to implementing self-managing work teams and is presented below.

Transitioning To Self-Managing Work Teams. Nearly all the literature reviewed agrees that most instances where self-managing work teams are used evolve from lower levels of participative management like quality circles.

Evolutionary Model. Tomasz Mrczkowskia, Professor of Management at Old Dominion University claims that these

companies often begin by implementing quality circles
followed by a pay-for-knowledge reward system. This pay
system allows for incremental increases in pay for
individuals as they accumulate skills associated with their
jobs and gain problem solving abilities from other working
with other members of the organization. Once these systems
are in place, semi-autonomous work groups can be easily
formed by giving naturally formed work units greater
authority of the different aspects of their jobs. After
some time passes, members of the group will become fully
competent in all the jobs performed by the group and can
assume responsibility for its composition, work pace, and
discipline of members. That is the point when autonomous
work teams are realized (21:383).

Six Phase Model. Richey agrees that the process
is evolutionary, but he gives a somewhat more detailed model
of how the teams are cultivated in the organization. His
model of the phases of development of self-managing work
teams is shown below in Figure 1 (28:41).

The very bottom of the pyramid is the pre-developmental
phase of the teams. It occurs when the company is run in an
authoritarian manner. Richey maintains that this phase can
actually prevent organizational improvement. The Foundation
of the pyramid is employee participation. The next level
extends the practice of employee participation with the
formation and operation of employee teams. Their purpose is
to identify problems and work to eliminate them. The third

Phases of Development

Figure 1. Phases of Team Development

stage is statistical quality control. Quality measurements
are established at this level.

Continuing up the pyramid, the next level is
statistical process control. As the organization realizes
that some of its processes are not fully in control, it
seeks to understand the costs associated with the problems.
Richey says that knowledge of the total quality costs can
only result from having the previous phases firmly in place.

The next level is a just-in-time supply system. Once
this is in place, self-managing work teams can be put in
place. At this level, the right number of people understand

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how to produce the job, in the right quantity, at the right quality level, at the right time, with no wasted resources (28:41).

Reaching the apex of the pyramid is not easy and there are no shortcuts to get there. Continuous efforts must be made to maintain each phase once it achieved. The leadership in the organization must adopt an attitude of continuous improvement to keep maintain the high performance system. Smith states notes that "the process is a long term undertaking...[with] minimal results the first year of operation ." He goes on to say that:

> ...the success of the concept hinges greatly on the willingness of the top Manager of the organization to make a significant investment of time and energy into the process and to have the persistence and patience necessary to allow the process to work. (33:321)

Seven Elements Necessary for Functioning. Philip Thompson, a manager at Martin Marietta Aerospace who has developed self-managed work teams at the company maintains that to function effectively, self-managing work teams need seven elements (35:353):

1. power
2. skill
3. supportive management
4. objective measures of work performance
5. clearly defined and mutually agreed upon goals
6. incentives
7. technical support

He then goes on to explain how the teams can be formed from quality circles by working these elements incrementally.

Power - Working the power element refers to empowering employees to take more ownership and autonomy over their jobs. The empowerment should include goal setting, performance measuring and tracking, problem prevention, planning, scheduling,, and job analysis and redesign.

Skill - Employee training must keep pace with added responsibility. The training should include initial problem-solving techniques, performance measures and tracking, problem prevention, goal setting, planning and scheduling, and job analysis and redesign.

Supportive Management - This means that management must adapt to the new work environment as well. Managers and supervisors must reward participation and build an atmosphere of trust. Essentially, they must learn to take a supportive rather than directive roll in the organization. Simmons adds that in the new workplace, "most of the traditional management and staff functions become resources to help teams get their jobs done rather than give them orders" (32:26).

Objective Measures - This is the key element for successful transition to self-managing work teams. Giardino submits that "a good system of measures is crucial to establishing accountability, establishing goals, and creating a feedback system" (14:5). The system of performance measurement must be mutually intelligible and

mutually agreeable so as to provide the common language necessary to build trust and communication between work groups and management.

Goals - Management must make a strong commitment to articulate organizational goals down through the levels and departments in the organization. Only then can the teams formulate specific, measurable goals in concert with the broader objectives (35:354; 17:67). It should also be noted here that effective communication is vital to ensure that the goals are clearly understood by everyone in the organization (32:28).

Incentives - The rewards given to teams should be commensurate with the additional responsibilities incumbent in self-regulation. If individuals do not feel they are receiving adequate pay or recognition for their efforts, job satisfaction will be sacrificed, and productivity in the organization will suffer.

Technical Support - The support areas of the organization must be involved in the formation of the teams. These areas such as finance, engineering, quality assurance, and maintenance are traditionally very directive in their approach to goal accomplishment. Involvement in the process should give them better understanding of the nature of the teams and create a more supportive environment.

From the information given thus far, it is now possible to generate a slightly more in-depth model for initiating self-managing work teams in the organization. The process

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generally begins when a senior manager or sponsor becomes committed to finding a better way to do the job. After this occurs, the logical progression of events is as follows (32:29):

1. The sponsor learns what others are doing.

2. A steering group is formed and educated organizational design to manage the change effort.

3. The steering group clarifies the mission and the desired organizational culture.

4. Design teams are chartered and appointed.

5. Team members gather as much information as possible by reading about organization redesign and making site visits to organizations that have implemented self-managing work teams.

6. The teams analyze the environment, technology, and jobs in the organization to find key variances and possible controls.

7. The teams consult with groups that will be affected by restructuring efforts and a plan is drafted.

8. The teams make recommendations to the steering group for approval or amendment.

9. The design is implemented.

10. The goods or services are produced.

11. An evaluation of the system and processes is conducted to measure performance.

12. Continual improvement of the system is programmed into the organization.

Summary

This chapter began by presenting an overview of the sociotechnical process. Sociotechnical theory was discussed as were the nine principles of sociotechnical design. After

that, the process of sociotechnical design was explained.
Once this concept was developed, the paper concentrated on
implementation of self-managing work teams in high
performance work environments. Richey's six phase model was
presented and the seven critical elements for successful
implementation were reviewed. Finally, a somewhat more
comprehensive model for implementation was shown.

III. Methodology

Overview

The methodology used in this thesis is aimed at answering the investigative questions posed in Chapter I. The investigative questions submitted are as follows:

1. Why did the organization decide to implement self-managing work teams?

2. To what extent is this concept implemented?

3. What are the necessary steps taken in order to successfully implement self-managing work teams?

4. What change in productivity is expected, or has been experienced, since implementation?

5. In what ways do self-managing work teams affect the internal structure of the organization?

6. How are the people of the organization adapting to this concept of management?

7. What are the lessons learned from implementing self-managing work teams?

8. What barriers to implementing self-managing work teams were encountered?

Due to the exploratory nature of this research, the main objective in devising the methodology was to gain as much depth and breadth of knowledge of the subject as possible in the limited time available. To accomplish this, the case study method was chosen. The case study approach is concerned with interactive processes with emphasis on "the detailed analysis of a limited number of events or conditions and their interrelationships (10:61). This detailed analysis should give insight into which factors are

important in the successful implementation of self-managing work teams.

Instrument Design

Very little information is available on sociotechnical design and self-managing work teams in large organizations. Thomas Siciliano, a senior Management Analyst at Headquarters U.S. Army Material Development and Readiness Command, points out three major reasons for this. First, there are past uncertainties the effectiveness and difficulty of establishing objective performance measurement under these designs. Second, communicating and implementing a complex system-wide change model in large organizations is difficult compared to smaller organizations. Finally, many fully integrated and well defined organizations are small and are more likely candidates for sociotechnical design efforts (30:271).

Due to this lack of information, it would be difficult to develop a comprehensive questionnaire. Consequently, interviews are used to give the researcher a better understanding of the organization under study. This method also allows subject areas to be probed more deeply in reaction to responses given by those being interviewed. The interviews conducted are semi-structured, personal interviews. Personal interviews were selected because "the depth and detail of information that can be secured...far exceeds the information secured from telephone or mail

surveys" (10:160). To aid the interviews, a general interview guide was developed. A general interview guide involves outlining a set of issues to be explored before the interview begins. This gives the flexibility to ask follow-up questions in areas discussed requiring more detail. The questions used in the interview guide were developed from the investigative questions posed and from knowledge gained from the review of literature. The interview guide used is included in this thesis as Appendix A.

Data Collection

Informal personal interviews were conducted with the key players involved in implementing self-managing work teams in the organization. The key players include management and staff members of the organization on the design team and outside consultants brought in to facilitate the change. These people were chosen because they have the most insight into the subject under study. Another consideration was that implementation of self-managing work teams was not yet complete in the organization under study. Accordingly, most of the other members did not have as full a grasp on the changes being effected. Due to the intense competition in this area of industry, the names of the organization and the personnel involved were withheld from this thesis.

In addition to the interviews, the researcher attended several of the design team meetings to record the progress

made in attaining the goals set forth in the design effort. The information from these meetings in addition to that gathered from briefing outlines, reports from other meetings, and progress reports was consolidated to assess what steps were taken to implement self-managing work teams in the organization.

Data Analysis

Since this research is exploratory in nature, analysis of the data was qualitative. This type of analysis required the use of judgement rather than statistical techniques. The analysis involved summarizing and recording the information gathered. An assessment of the investigative questions was made based on the summarized data. Since the change process is still on-going in the organization, the information gathered does not establish the entire process the organization used to implement self-managed work teams.

IV. Analysis and Findings

Introduction

This chapter gives the results of the data gathered and is presented in two main parts. First, the background material for the case study is presented. The state of the organization and the reasons why management decided to transform the company are offered. Next, the strategy the company will use is be discussed. This is followed by a review of processes and the organization structure for the redesign actions. Finally, the critical elements in the design process are presented.

Background

The organization studied in this research is a manufacturing organization whose principle product is composed of two primary components and has a limited shelf-life. There is also a distribution center co-located with the manufacturing plant. The company is a subsidiary of a multi-national organization who sets the broad goals and objectives it must follow.

Two years ago, the parent company was experiencing slow growth and top management felt that the company might be a good target for a takeover by outside agencies. The management then began to mount a defensive strategy to deter other companies from attempting actions of this type. To do this, the company needed to turn around quickly. Moderate

growth (about ten percent) was not considered adequate. The strategy adopted was to make sweeping changes in the organization ranging from dramatic cost cutting measures to changing the management philosophy of the company with the ultimate goal of going with full-scale self managing work teams and a high performance system within 18 months. In the interim, the company would continue with its self improvement programs and enhance employees self improvement skills.

To make the desired changes in the company happen, top management decided on three main operations strategic goals. These goals are:

1. Improve the quality of the product.

2. Improve the service given to customers.

3. Reduce the cost of making and distributing the product.

A complete statement of the company's strategic vision is included as Appendix B.

Improving Quality - To improve the quality of the product, the most important point was to ensure the shelf-life of the product was not exceeded. Accordingly, product turns for component A were increased from 12 to 24 per year and from 3 to 18 per year for component B. A product turn occurs when all the inventory for that product is used, sold, scrapped, or shipped out of the plant for any other reason. Product turns are also stated in terms of inventory cover. For example, component A now has 24 product turns

per year. This equates to an average of 365 ÷ 24 = 15.2 days of inventory held in the plant.

Improving Service - To improve the service given to customers, the organization decided that the broad areas to concentrate on were related to delivery of the products rather than on customer relations. The areas emphasized were on-time delivery, orders shipped complete, and item fill. Item fill is the percent of the units ordered that are actually shipped to the customer. Table 1 shows the current state of these areas and the target levels set forth by the organization.

Table 1.

Current and Target Customer Service Levels
(Levels are percentages)

Area	Current	Target
On-time Delivery	84	> 90
Orders Shipped Complete	81	> 90
Item Fill	97.6	> 99

Reducing Cost - Cost reduction is the third requirement for turning the organization around. Several steps are being taken to achieve the $100 million corporate-wide reduction goal $50 million of which is to be achieved by the company under study.

First, the company studied is decreasing the number of its facilities. There are presently 12 manufacturing facilities and 14 distribution centers operating to produce the product. After the reductions, there will be only four manufacturing facilities and six distribution centers. At

first glance this may seem to indicate that the company will reduce its capacity to produce as well as costs. However, the facilities remaining in place or relocated to more accessible areas are to be operating in regions within 89 percent of the company's customers. This measure alone is projected to save the company over $3 million in working capital annually. Also, production capacity will not be diminished. Moreover, due to the decrease in on-hand inventory resulting from the increased product turns, the cost to hold inventory will substantially decrease and production capacity could actually increase.

Strategy and Expected Returns. To make the facility reduction to happen, the company has spent $80 million for new construction, remodeling of existing facilities, and equipment for the sites. The company expects to recoup these expenditures within the first few years of implementation of their new strategy. They anticipate an annual cash savings of $19.3 million and savings due to inventory reduction of $16.8 million. Additionally, the company's analysts performed a hypothetical Taguchi analysis on the possible positive effects on customer service if the product consistently does not exceed its shelf-life. According to this technique, a customer will relate a good experience with a product or company to three other people. Under this scenario, keeping the product under its maximum "age" could result in a nine percent increase in volume. This equates to a $13 million increase in sales.

Another way the company will save money is the decrease
in number of "buy-backs" from vendors and other customers
resulting from over-aged product. Currently, the company
spends from $80 - $120 million per year because of this. No
exact figure was given for what the possible savings are,
but they are considered to be significant.

Transforming the Organization

Wile designing the plans and actions necessary for the
organization to achieve its broad strategic goals, the
company went beyond top managements expectations of a good
defensive strategy from take-over. Management decided to
restructure the company into a high performance organization
by using the principles of sociotechnical design. An
outside consultant was brought into the redesign effort to
facilitate the process. Design teams were formed to
restructure the manufacturing processes for the two
components of the product and, as mentioned earlier, over
$80 million was invested by the organization to make the
change happen.

Organization Structure For Redesign. In order to bring
about the desired changes in the organization, some sort of
method must be devised to ensure the restructure is
performed in an orderly, effective manner. The first step
in doing this is to create a governing body within the
company to direct and monitor the change. Figure 1 shows

the structure of the governing body used in the company studied.

At the top of the structure is the sanctioning group. This group is composed of the site manager, the local union president, and other top managers at the site. For tne purposes of this thesis, the term "site" refers to the manufacturing facilities and distribution center of the company studied. The roll of the sanctioning group is to review the actions taken by the design teams and approve or reject them.

Organization Structure
For Redesign

```
                    ┌──────────┐
                    │ Sanction │
                    │  Group   │
                    └──────────┘
                          │
                    ┌──────────┐
                    │   Site   │
                    │ Steering │
                    └──────────┘
              ┌───────────┼─────────────┐
       ┌──────────┐ ┌──────────┐  ┌──────────────┐
       │   Site   │ │ Product B│  │ Distribution │
       │Leadership│ │ Steering │  │    Center    │
       └──────────┘ │Committee │  └──────────────┘
             │      └──────────┘          │
      ┌──────────┐      │            ┌──────────┐
      │ Product A│   ┌──┴──┐         │  Design  │
      │ Steering │  PAT   PAT        │   Team   │
      │Committee │  Team  Team
      └──────────┘
        ┌──┴──┐
     Design  Design
      Team    Team
```
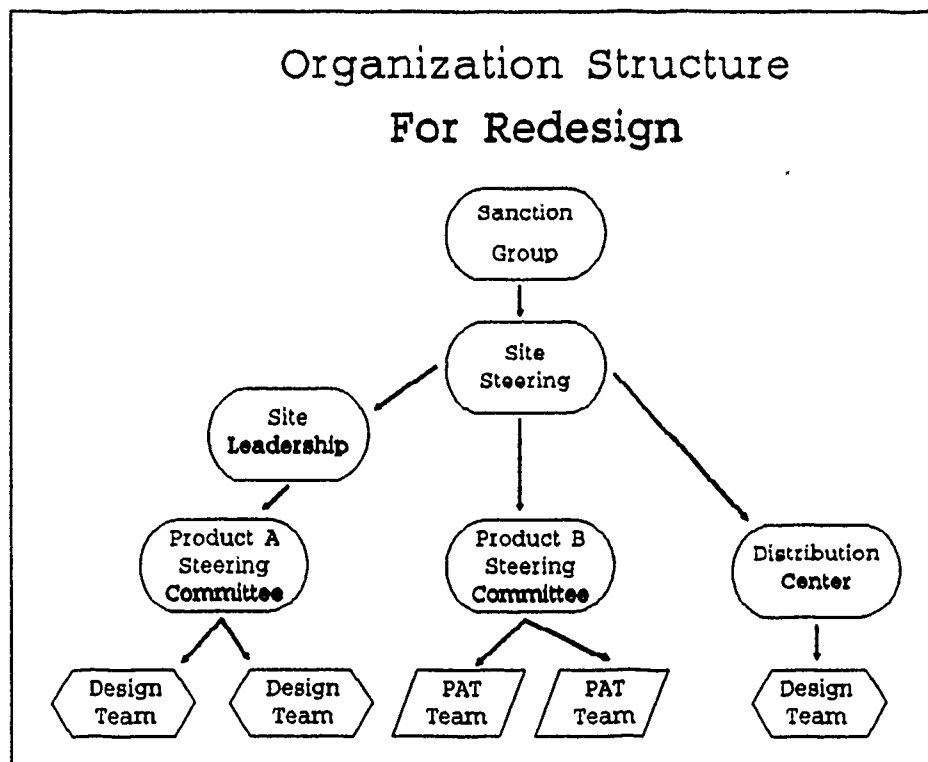
Figure 2.   Organization Structure for Redesign

The site steering committee is responsible for three main activities. They are charged to: 1) Charter the design teams, 2) Provide guidance and leadership for the

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design teams, and 3) Review and either approve or amend the actions of the design teams. The steering committee also discusses the philosophy and values the new system will embody and how things will be different from the traditional work place (19:81).

The site leadership reports directly to the site manager who, in turn, reports to the corporate headquarters. The site leadership's function is to review and make determinations of resource allocations across the site.

The steering committees for product A and the distribution center oversee the actions of the design teams for those areas at the site. They have much the same responsibilities as their counterparts at the site level, but at a lower, more specific level.

The design teams and process action teams (PATs) perform a variety of functions. The teams consist of key managers, supervisors, and self-managed work team leaders along with other key people in the organization with technical expertise in the areas undergoing redesign. In general terms, the design teams and PATs scrutinize every aspect of the processes, both socially and technically, and find ways to improve them. In this company, the improvements include, to a large extent, getting the self-managed work teams involved with nearly every aspect of the management, manufacture, and distribution of the product.

Developing the Processes. To properly develop the processes the company will use in implementing its high

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performance system, the members of the steering committees and design teams first reviewed the steps involved in a process. In general, there are three steps. First, there are inputs into the system. The inputs come from suppliers who can be either internal or external to the organization. Internal suppliers are situated within the organization. They can supply raw materials to the using activities or their outputs can be used by downstream activities in the manufacture process. Second, there are the activity steps, or the transformation processes. These are all the actions necessary to transform the inputs into outputs. The third aspect of a process is output. Output is the end result of the process. If the process is the last step in the overall manufacturing process, then the output is the final product. Otherwise, the output is an intermediate product and will most likely be used as an input in downstream activities. Figure 2 shows the general definition of a process.

The processes in the organization are analyzed by the design teams. While examination of the inputs and outputs is important, much of the effort is concentrated on the activity steps. These are the areas that the teams have the most control and can be changed to bring about the desired improvements.

Elements of the Design Process. At the time of this study, the company's implementation of the high performance work environment was still in the analysis stage. All of the design teams had not yet been chartered, and plans for

Process Definition
Three Parts

Inputs → Activity Steps → Outputs
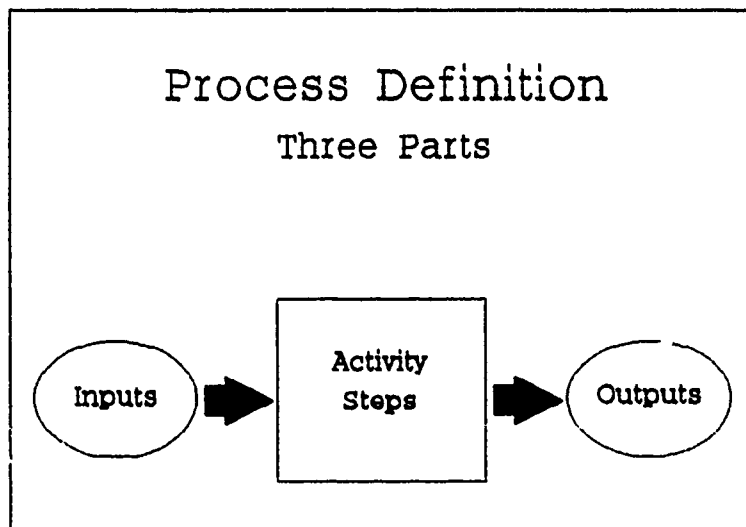
Figure 3.   Process Definition

start up had not yet been finalized.   The researcher was able to sit in on the meetings held by the steering committee for component B of the product.   After analyzing the system processes, the steering committee identified 15 design elements that are critical for successfu implementation of the system.   They are as follows::

1. Product quality systems.

2. Human safety.

3. Material flow and concept.

4. Structure of work teams.

5. Information needed for continuous improvement.

6. Placement of tools at the site.

7.. Implementation of Good Management Practices (GMPs) and government requirements.

8. Status symbols such as job titles, clothing, and offices.

9. Sa..itation: Frequency, procedures and use of chemicals.

10. Initial assignments for new hires.

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11. Product safety programs.

12. Relationship with the union.

13. What the important things to measure are.

14. Communications strategy.

15. Integrate the assessment process.

At the time collection of data ended, some of these design elements were little more than definitions. Others were defined extensively and were well into the analysis stage. Another important aspect of the redesign effort--training--was not included in this list of critical design elements, but considered separately due to its importance and the depth at which it is being treated by the company.

Ownership of each of the design elements was assigned to one member of the steering committee. The steering committee member formed a team of other employees at the site that have a stake or expertise in that particular area. This team was given the responsibility to examine all issues associated with the element and develop a position paper and action plan covering what is needed for implementation of that element.

Product Quality Systems. Product quality systems are those which guarantee that all the products produced at the site meet the parent company's specifications and consumer/customer expectations. The issues associated with this element are :

1. Supplier guarantees and inspection of raw materials.

2. In-process quality controls such as weights, temperature, etc.

3. Consumer/customer feedback.

4. Complaint response.

5. Company policy and employee training on quality.

The team reviewing quality systems consists of two to three line personnel, a maintenance and engineering representative, a quality assurance manager, the start up team leader in the area, and for coordination, the quality assurance representative from corporate headquarters. At this time, no further action has been taken on this element.

Human Safety. Currently, the main thrust of the safety program is the Behavioral Accident Prevention Process (BAPP) training. BAPP is a program to get all the employees at the site involved in monitoring accidents that occur at the site. There are now more than 25 union employees being trained in this program with the ultimate goal of 100 percent of both union and non-union employees fully trained and qualified as safety observers.

The way the program works is a group of employees examine each of the accidents that have occurred at the site over the last three years and finding out what behaviors were common in many of the accidents. The emphasis in this process is not on the environment causing accidents, but on how each employee reacts within the site environment. The point being that accidents can be avoided by being aware of

hazards in the plant and by knowing that safe behavior reduces that chance of having an accident.

After all the information has been analyzed, score sheets are made to reflect the behaviors that are necessary to do each job safely. Then, on a frequent basis, employees observe other employees as they work, score them on how safely they do their job, tell them how well they are doing. and help them perform the job more safely. One point that is strongly hit on in the training is that this program is not to be used as a disciplinary tool. It is merely used to reduce the chances of accidents occurring.

Material Flow and Concept. This element was coupled with the line scheduling and production run element. These elements address the problem of scheduling the material flow through the site. This is an important aspect of the business because the company is transforming from a "push" material flow philosophy based on independent demand to a customer "pull" concept based on dependent demand. In the "push" philosophy, the raw materials released into the system are "pushed" through by some forecasted demand. Since demand for any product is subject to time series factors like seasonality, trend, cycles, and randomness, stock levels and safety stock levels must be retained to ensure production is not interrupted due to a shortage of raw material (1:624).

In the high performance organization being implemented, the excess inventory that must be held under the "push"

system is undesirable because of the capital tied up in inventory and the cost to hold it. Instead, the company is instituting a material requirements planing (MRP) or customer "pull" system. This system is based on dependent demand. The system works in the reverse direction of its traditional counterpart. Raw materials are released into the processes based on the number of units of product demanded by the customer. Under this system, the manufacturing occurs in lots, and all the items needed to produce the lot ar usually withdrawn from inventory at the same time (1:637).

One drawback to this system is that scheduling is very complex. To aid in this area, a computer software package is under development to speed the computations required to optimize the use of the reduced inventory in terms of production time and cost. Figure 3 shows how the software can be used at the different levels of production planning.

Structure of Work Teams. This element addresses the issue of what the make-up of the self-managed work teams should be. The steering committee determined that there are three main steps to the design of the teams. These are:

1. Build a description of key variances of the work process.

2. Define all relevant skills required to make that team able to self-manage the work process.

3. Define a method of progression through those skill sets (i.e., certification and observation of skills).

Where Scheduling Software Is Used

Planning Hierarchy | | How Used

Strategic Planning — **5 Year** — **Capacity planning and capital acquisition. New products and competative strategy.**

Long Term Planning — **1 Year By Month** — **Upper level forecasts. Inventory and marketing strategy. Budget constraints.**

Mid Term Planning — **3 Month By Week** — **Shipment forecasts. Preventative Maintenance. Staffing and machine constraints.**

Short Interval Scheduling — **1 - 4 Weeks By Shift or Day** — **Customer orders. Material releases. Crew scheduling.**

Figure 4. Use of Scheduling Software

To achieve the three steps mentioned above, the effects of variance were explored by the group. As mentioned in the review of literature, variance refers to any deviation from expected output that is not planned for. A variance is key if it significantly affects (1) either the quantity or quality of production, and (2) either the operating or social costs of production. The process of identifying key variances is shown in Figure 5.

As shown, the manufacturing mechanism occurs in steps or processes to produce the final product. Each of these processes have variances associated with them. The task of the group is to analyze the processes to determine the variances within them. Once the variances are found,

Three Steps In
Work Team Design

Processes
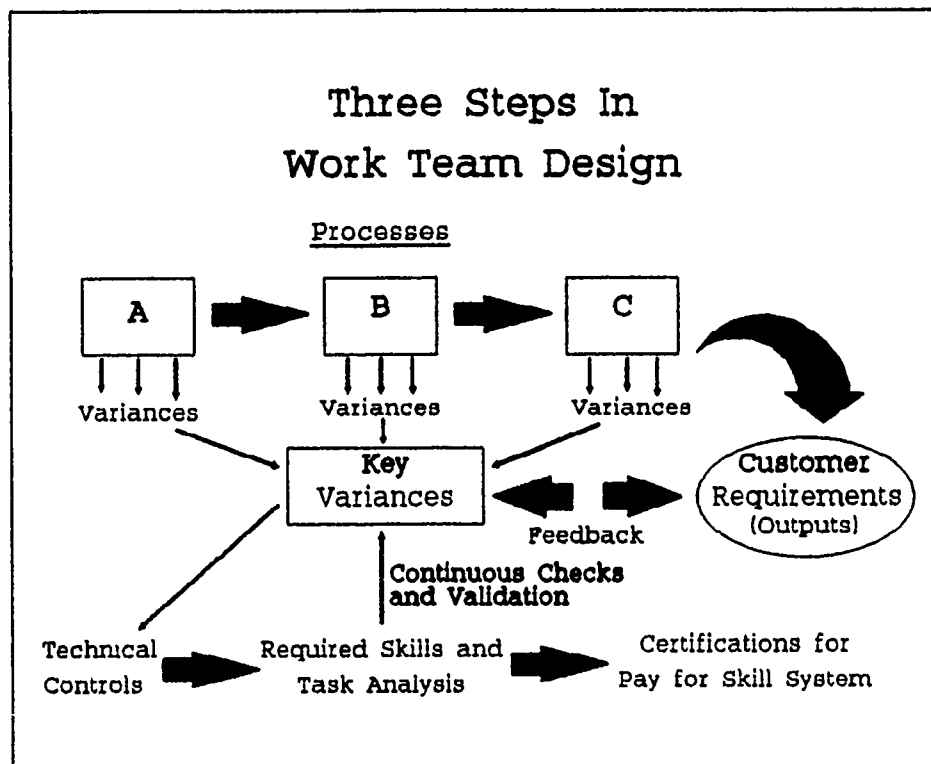
Figure 5.   Steps in Work Team Design.

they must be further scrutinized to determine which of them
are key.

Once the key variances are identified, technical
controls can be developed and activated to minimize or
eliminate them.   Some variations are due to randomness
within the process and are considered uncontrollable.   Other
variations can be assigned causes such as discrepancies in
raw materials, processes and machines, or human error.
These are the variances that the group must identify and
correct to bring the overall mechanism under control to the
maximum extent possible (18:90-91).

After the technical controls are developed, each task
in the process is reviewed to determine what skills and

training are required to perform the job with minimal variance. This is an iterative process. Once corrective measures are put in place at this stage, the key variance list is reviewed to determine which ones are no longer key or have been eliminated. The task analysis can also serve to certify employees for job skills they possess. The company's plan for the future is to start a pay-for-skill reward system at the site. Under this system, employees are paid based on the breadth of their knowledge of the system. The more skills they possess and the more jobs they can perform, the higher their pay. Every additional skill the employee acquires, will result in extra pay for that individual.

The other feedback loop in the process is from the company's customers. The customers may have problems with the product such as poor quality, late deliveries, or increased cost that may not be readily apparent to the company. This feedback is analyzed to determine if additional controls must be placed on the key variances to assure adequate customer service.

Information Needed for Continuous Improvement. This element is basically production feedback. It includes cases of product produced per hour, usage rates of raw materials, and quality assurance test results. Some of this information is needed on an hourly basis and some is needed daily. The requirements of each piece of information still must be determined. Forms to collect the data must also be

developed and dollar figures should be assigned to give the usage data meaning. No other action has been taken on this element as of yet.

Placement of Tools. This issue deals not only with the placement and storage of tools at the site, but also the storage of hazardous materials. The members of this design team are representatives from maintenance and the various shops at the site. Blueprints of the site layout were examined and possible locations for storage areas were explored. As of yet, no final decisions have been reached in this area. Any decisions reached by the design team and steering committee will be coordinated with the engineering and safety departments to ensure all requirements for the storage facilities are met.

Implementation of GMPs and Government Requirements. This element provides a structure which guarantees that good manufacturing procedures are understood and used by all employees at the site. The structure also ensures that all applicable guidelines set forth by government agencies are understood and accepted. The issues dealt with are:

1. Plant GMP policy.

2. Training for government requirements.

3. Ordering supplies which fall under GMPs.

4. The BAPP training program.

5. Sanctions from corporate headquarters quality assurance.

Team members for this element are two to three line personnel, maintenance and engineering representatives, sanitation personnel, an inspection section representative, and a representative from corporate headquarters quality assurance for coordination.

Status Symbols. The objective of this element is to eliminate all status symbols that contradict the vision statement created by the organization. Examples of these symbols are time clocks, uniforms, and job titles. The vision statement presented in Appendix B explains the direction the company wants to go with this concept. At this time the concept is being applied in principle only, but full implementation of the vision will be achieved at program start up.

Sanitation. This element deals with the process which implement and monitor site sanitation procedures, frequency of cleaning, chemical usage and pest control activities. Issues associated with sanitation are:

1. Cleaning crew size and structure.

2. Cleaning procedures and frequency of cleaning.

3. Ordering and storage of chemicals.

4. Chemical safety programs.

5. Maintaining and ordering equipment.

6. Sanitation policy and employee training.

The design team is comprised of a team leader who is responsible for developing a position paper on the subject, maintenance and engineering representatives, a sanitation

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crew, an inspector, and a corporate technical service person.

Initial Assignments for New Hires. The emphasis for this element is to match existing skill sets of the people hired into the company to their initial assignments necessary for start up. This element is closely linked to the assessment process employees will go through when they are hired into the company and will be discussed in grater detail later in this paper.

Product Safety Programs. Product safety programs are defined in the company as the system which guarantees that all products manufactured and distributed by the company are safe to consume. The issues associated with this element are:

1. Supplier guarantees and raw material inspection.

2. In-process controls.

3. Environmental programs.

4. Hazardous material procedures.

5. Construction hazards.

6. Policy statement and employee training.

7. Trace and recall of defective products.

The team responsible for these issues consists of two to three line personnel, maintenance and engineering representatives, the site quality assurance manager, the team leaders from the start up team and the distribution center, and the corporate quality assurance representative.

Relationship with the Union. In any organization redesign, cooperation with the union is essential. In this effort, the design team is working on three main points. First, the company wants to be sure to communicate with the union members. This issue is discussed more fully under the heading "communications strategy". Second, the team is seeking active involvement by union leadership in the design process. Union inputs to the steering committees and design teams will facilitate cooperation and preclude many problems and misunderstandings between labor and management. Forging this partnership is the third point the design teams are concentrating on. This will ensure that both business and individual needs are met.

What to Measure. This element is focuses on determining what the important areas to measure in the company are. There are five main issues that fall within the boundaries of this area:

1. Measurements are needed to provide a baseline for the business.

2. Measurements are needed to provide a basis for continuous improvement.

3. Measures derived from corporate data must be defined.

4. Measures derived from site data must be defined.

5. Measurements dimensions--safety, quality, productivity, customer satisfaction, and responsiveness to customer complaints.

Work is on-going in this area. Team members looking into these issues include senior site management and several of the steering committee members.

Communications Strategy. Effective communication is perhaps the most important aspect of any organization. The company studied fully understands this and has begun a comprehensive communications plan for the site. The purpose of the plan is to define and set into action communication strategies and tactics that will support the site's goals and objectives. The plan development process contains three main points:

1. Define issues and develop key massages. Interview key plant leaders and supervisors. Formulate a six-month content strategy.

2. Interview employee groups about what information is most desired and the effectiveness of current communications vehicles and activities.

3. Draft the plan and review it with the redesign teams.

There are six components to the site communication plan. The first component is the communication mission. The goal of the plan is to support business objectives by raising employee awareness and understanding of the business, and to align employees with the values and changes needed to transform the work place into a more participative environment. There are several effects expected from improved communication at the site:

1. Support culture change.

2. Allow employees to take greater responsibility.

3. Assure "bottom up" communication.

4. Increase employee knowledge of the company, which will lead to self-reliance.

5. Enable employees to take a partnership role in company.

6. Enhance union and other stakeholder relationships.

The second component is the business context of the communications program. This component is still under study and will be more completely defined at a later time.

The third component is the communications process. Here, the audiences that must be communicated to are defined. Also the roles and responsibilities of key personnel in the process are indicated. Figure 6 shows these relationships.

The fourth component of the communication process are communication programs that deal with how roles and responsibilities should be carried out. To do this, face to face communication is stressed in the plan. Staff members (management) are encouraged to spend time with employees on the shop floor. Also, supervisors hold monthly meetings with members of the work teams. Quarterly meetings of all the employees are held for the three major areas of the plant. In other words, all the employees for component A gather once a quarter as do the employees working on component B and at the distribution center. The site manager also holds regular informal "coffee talks" with employees.

Communications Process

1. Audiences

Union
  Leadership
  Management
  Membership

Community
  Media
  Opinion leaders
  Government officials
  General Public

Component A
  Site team members
  Management
  Distribution Center employees
  Maintenance

Component B
  Team members
  Management

Site
  All employees

2. Roles/Responsibilities

Site Manager
  Overall responsibility
  Key spokesperson

Human Resources (HR)
  "Prime Mover"
  Articulate goals and objectives
  Assures communication process
  runs smoothly

HR Director
  Key spokesperson on union issues

Supervisors
  Communicate with teams in regular meetings
  Operationalize key messages
  Voice employee issues and concerns

Corporate Representatives
  Visit site regularly and communicate
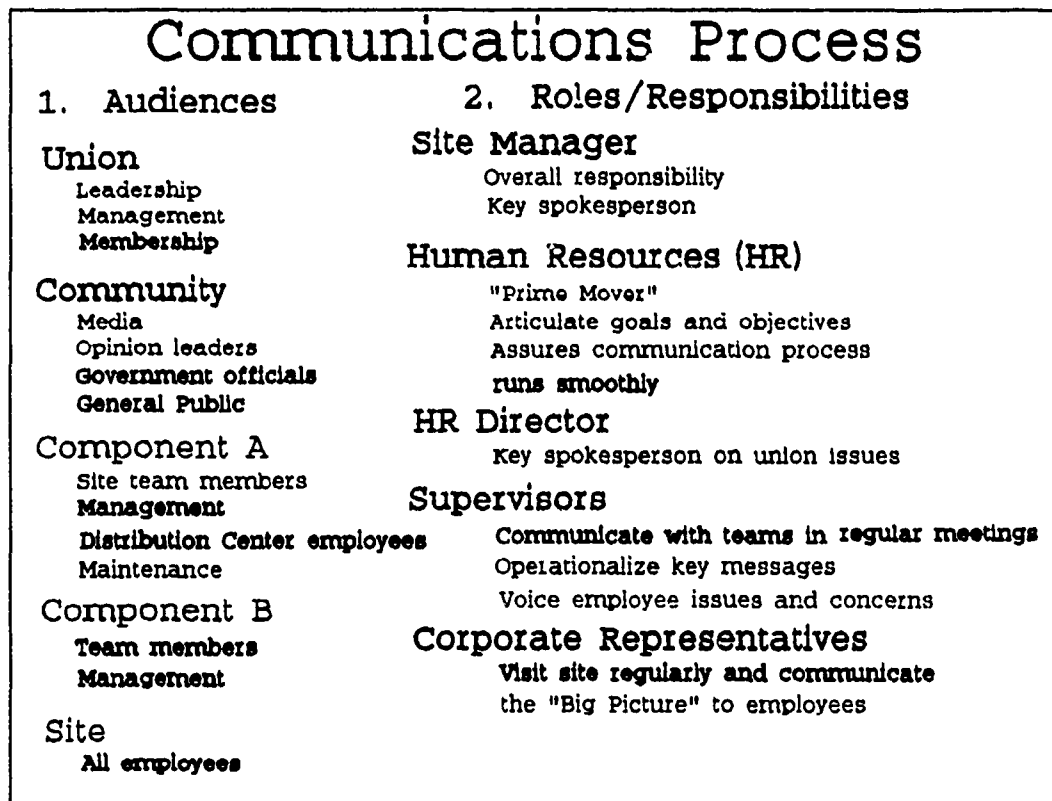 the "Big Picture" to employees

Figure 6. Communication Process

To supplement the plan, the company is looking into is publishing a site newsletter. The idea behind the newsletter is that an employee involvement approach should be taken to ensure high employee readership and to provide another model for the team working style. The newsletter could be produced by the communications committee composed of team members and managers from various levels and areas of the company. Employees would not only have input into what goes into the newsletter, but would also get a better idea of the strategic goals of the company and the attitudes of the managers.

Included in the communication program is the short-term communication strategy. The company defines short-term as

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about six months. The strategy is to inform employees on the company's position on union issues in order to gain greater acceptance at negotiation.

The fifth facet of the process is the content strategy. The content strategy defines issues and the company's position on them. Senior site leadership is now developing this strategy.

The rest of the communication process has been place under the heading of challenges and other tasks. The challenges are to provide financial and operational information to employees in an easily understood fashion. The supervisors will play a critical part in providing communications links between line employees and managers. The Human Resources department will provide whatever support is necessary to ensure supervisors gain the skills required to carry out this function. The other major communication task the company must address is to develop an external relations plan, which includes community, government and media relations.

Integrating the Assessment Process. The assessment process is the first major step to actually implementing self-managing work teams at the site. The assessment identifies the employees' skills and training needs. More specifically, it measures:

1. Teamwork - Ability to work in teams.
2. Motivation.

3. Communication Skills.

4. Ability to learn.

The feeling of the steering committees and site management is that the behavioral traits of employees is more important than their technical skills.

The idea behind the assessment is to hire people into an area that does not require extensive technical and personal skills, assess them, and transfer the people who rate above 3 standard deviations (the top 98%) in technical and social skills to work in self-managed work teams in the initial pilot programs at the site. In order to get a high validity coefficient, the reject rate of new hires to work in the teams must be 10-15 to 1. This may be changed, though, because of restrictions imposed by the union, limitations of the applicants, or various other reasons.

To integrate the assessment process into all aspects of the design effort, the design team members must all be educated on all steps in the assessment process. With a good understanding of the process, the team members can be involved in all major decisions regarding assessment.

Training. The company decided that by the start up time for the high performance work system they wanted to update and upgrade their training program. The first step the company took to accomplish this was update/replace their training guides. The manuals needed were on-the-job training (OJT) guides, Instructor guides and self study overviews, and skill qualification/certification

documentation. The instructor guides are used primarily to facilitate the self study overviews in the classroom for highly specialized training needs. The qualification/ certification is used in conjunction with the OJT guides to qualify operators on the various pieces of equipment.

Initially, the company wanted to hire an outside agency to develop and deliver these materials. However, due to the high cost, they steering committee decided to contract out the most critical, in-depth manuals and try to generate the remaining ones in-house. They will base the new manuals on the existing ones and update/upgrade them based on their knowledge of the system and with the help of experts in each of the areas at the site.

After the manuals are developed, there must be an effective method of implementing the new training program. The first step in the company's plan is to identify personnel at the site to act as trainers or coaches. These people will then be led through the actual training sessions as if the were newly hired "students". The final phase in this training is for the trainers to go through the various on-the-job performance qualifications. Once these people have completed all of the training requirements (it should take about a week), they will begin training the next group of people.

This program is already under way. As a pilot for the program, the company hired three new people and immediately sent them through training. This first group of trainers have

completed their qualifications and are now ready to become trainers themselves. This training is only the beginning of the company's more encompassing plan to get the site employees as self-sustained and involved in running the company as possible.

Summary

This chapter reviewed what the organization has done to achieve its strategic goals. The overall goal is to be the best manufacturer in the business. The means the company chose to achieve this goal is to implement self-managing work teams in a high-performance work environment by using the principles of sociotechnical design.

Background information was presented to explain why the organization decided to undergo redesign. Next, the strategy employed to achieve the desired results in the organization and some of the expected outcomes of that strategy was discussed. The main thrust of the chapter, though was on the transformation process itself. The organizational structure for the redesign was given along with an explanation of processes. Finally, the 15 elements the steering committee felt were critical to the restructuring effort were reviewed followed by a discussion of the company's training program.

V. Conclusions and Recommendations

Overview

The purpose of this chapter is to present the results of the data collection and literature review as they pertain to the investigative questions presented in Chapter I and to make recommendations based on those results. At the end of the time allotted for data collection, implementation of the redesign plans at the site was incomplete. Many of the design efforts were well along in the planning stages and ready to be set in motion. Some were in the beginning stages of implementation but not fully on-line. Because of this, the investigative questions will be answered as best they can based on the data collected.

Conclusions

Why Did the Organization Decide to Implement Self-Managing Work Teams? As stated in the analysis of data, the company studied was experiencing a period of slow growth two years ago. Top corporate management thought this made them a probable target for takeover. Sweeping restructure was made throughout the company to strengthen their financial status. In the beginning, the redesign was a defensive business maneuver. Once the changes began; however, and company management began learning more about high performance business strategies, the design effort took giant strategic leaps to change the entire management

philosophy of the company. One of the principle directions that this philosophy is taking is to get the employees as involved in running the company as possible.

To What Extent is this Concept Implemented? This question cannot be given a final answer at this time. However, the strategic plan of the company and top management's vision is to involve self-directed teams in as many aspects of the manufacturing process and in managing each area as possible. The tone of the design meetings support this vision. Teams were formed to look into all aspects of the areas being effected by the restructure. Three people were hired in a pilot program to get employees started on a program where they will actually conduct training for the other employees at the site that work in their areas of expertise. The goal of this program is to get everyone at the site qualified as trainers. This is especially evident in the safety training program now under way. To involve the teams in management functions, team leaders are to be present at various meetings with the staff and top management of the organization to give their input. The teams will also have input in the communications that occur in the plant. They will have representatives on committees for site newsletters and information sheets distributed.

What are the Necessary Steps Taken in Order to Successfully Implement Self-Managing Work Teams? The company has taken many steps toward full-scale

implementation of the program. The first major step taken
was that top management had a vision for the change and gave
the vision its full support. Over $200 million was funded
to make the redesign effort happen. An outside consultant
was brought into the endeavor and a sanctioning group,
steering committees and design teams were formed to get
initiate and manage the process. A critical path was then
generated to chart the progress the company was making from
the beginning of the design process through full
implementation of the program. The critical path is listed
in Appendix C. The design teams were charged to examine
every aspect of the manufacturing process effected by the
redesign. At the end of the data collection period, the
design team had generated a list of the critical elements
for implementation and begun to examine all the variances
that could affect these elements. Further examination of
the variances will identify which are key variances.
Controls to these key variances are then to be generated and
ownership of these controls will be given to the teams.
After the teams are fully functioning, they are to also have
ownership of the continual improvement of the processes
themselves.

Additionally, several training programs are already
under way to acquaint everyone at the site with the concepts
being designed. Comprehensive communications programs are
also being developed to gain support and smooth the
implementation process. An assessment program is also being

used in hiring new employees to identify those whose social and behavioral profiles indicate their aptitude for team participation and self-management.

What Change in Productivity is Expected, or has been Experienced, Since Implementation? Even before completion of the redesign effort, the actions taken thus far have resulted in a 15 percent increase in profit for the organization. Recently, corporate management mandated that the final increase should end up being 38 percent. Members of the steering group feel that this figure may be a little optimistic, but they do feel that they can do significantly better than what has already been achieved.

In What Ways do Self-Managing Work Teams Affect the Internal Structure of the Organization? So far, the structure of the organization has not changed dramatically. This is because the present structure must remain in place at least somewhat unchange in order to run the company during the transition period. Inference made from the review of literature indicates that the company should. reduce the levels of management between top management and line workers significantly. It must be noted; however, that fully operational self-managing work teams probably will not be in place for two to three years. They must be cultivated and given ownership of the job incrementally. This allows . workers to learn more about the direction the company is headi. y and accept responsibility for the job as well.

How are the People of the Organization Adapting to this Concept of Management? So far, the people of the organization are very positive about the change. Some of the members of the steering group and top management have some experience in sociotechnical design and self-managing work teams. These individuals are enthusiastic and are confident that the venture will be carried out smoothly and successfully. The union also seems to accept the changes. The impression received is that everyone accepts that the high performance system is the next stage in the evolution of business and without adapting to accommodate the changes could seriously harm the company in the competitive market.

What are the Lessons Learned from Implementing Self-Managing Work Teams? Several important lessons have been learned during this endeavor. First, and perhaps most importantly, the skills and knowledge of the employees are valuable resources to the organization. In the traditional directive style of management, these resources were not tapped and many companies did not reach their full potential. In this system, employees have input into almost everything and productivity has already increased even though implementation is not complete.

Another important lesson learned is that the union must be part of the redesign. The union is represented on the sanctioning group and many possible misunderstandings have been averted by consulting with the union in the early stages in the change. In fact, the steering group is

currently trying to get a union representative on the component B steering committee for input at a lower level in the restructure effort.

The organizational structure of the redesign team is also important to successful implementation. The steering committee for component B began as one of the design teams. When it became evident that the team was handling too many issues, they became a steering group and formed other design teams to examine individual issues more in-depth. The structure shown in Figure 2 of this thesis provides for orderly, effective management of the effort.

What Barriers to Implementing Self-Managing Work Teams were Encountered? Thus far, no significant barriers have been encountered by the design teams. Management is giving the program full support. Since the employees are being introduced to the new system incrementally and are receiving the proper education and training for their new roles in the organization, they are accepting the changes being introduced. The union is also accepting the changes in the organization. Having input into the process seems to have eliminated much of the tension that normally occurs when management "pushes" change onto the employees.

Recommendations

Since this research could not be carried through to full scale implementation of self-managing work teams in this company, many questions remain unresolved. Further

research is then recommended in several areas. First, the case study should be followed up by a future student. The steps the company takes in actually bringing the teams on-line should be documented. Lessons learned along the way and barriers encountered should also be recorded.

Additionally, analysis of the changes in the organization brought about by self-managing work teams should be done. Changes in productivity should be closely examined to determine the extent of the change that can attributed to the teams. A cross sectional analysis of other companies using the concept should be done to establish and validate the significance of implementing the teams.

More longitudinal studies need to be performed on this subject. Even though the principles of sociotechnical design were developed nearly 40 years ago, large organizations in the United States are only now beginning to realize their significance and are implementing them. The long range effects that self-managing work teams have on businesses needs to be explored further and documented.

Appendix A: Interview Guide

1.   Why did the organization decide to implement self-
     managing work teams (SMWTs)?

2.   What are the goals and objectives of implementing
     SMWTs?

3.   In what areas of the organization will SMWTs be
     implemented?

4.   What steps were taken to implement SMWTs in the
     organization?

5.   What were the major obstacles encountered in setting
     SMWTs in motion?

6.   What changes in productivity are expected or have been
     experienced since introducing SMWTs?

7.   What incentives are present to increase productivity?

8.   What feedback and control systems are used to monitor
     the progress of the SMWTs?

9.   Has the technology at the site been altered to fit the
     social restructure at the site?

10. What changes in the organizational culture have been
     noticed since implementation?

11. How much responsibility and ownership will team members
     have over their jobs?

12. What actions were taken in the interim between
     introduction of the program and implementation?

13. What lessons have been learned from implementing SMWTs?

Appendix B: Statement of Organizational Vision

1. To be the best manufacturing plant in the world.

2. Provide the highest long term return on investment among processing plants in this business.

3. Decisions based on long term growth.

4. Positive impact on the community--Community involvement.

5. Employees are flexible, diverse and multiskilled with an attitude of helping the team.

6. Organized into self sustaining teams that will seek outside resources as needed.

7. People clustered around a whole job or process.

8. Self-starting work atmosphere with high initiative.

9. People empowered to make decisions close to a given situation.

10. Explicit about facility values and moral structure.

11. Everyone working toward common goals.

12. A clear definition of the facility purpose and the plans to accomplish that purpose.

13. Union and management cooperation.

14. extensive, direct communication.

15. Free flow of information across all lines.

16. Impatience with the status quo.

17. An enthusiasm for continuous improvement.

18. Know an d understand what customers want.

19. Quantitative measures of improvements.

20. Proces es and methods are open to change.

21. High quality and productivity.

22. An organization structure that minimizes levels of decision making.

23. Each individual knows what his or her contribution is to the business.

24. All symbols reflect equality.

25. Celebrations include everyone.

26. Employee recreation for all.

27. Fluid culture--the ability to change.

28. Everyone on a friendly, first name basis.

29. Pride in working at this facility.

30. High employee satisfaction.

31. Employee work and outside interests are balanced.

32. Employee turnover and absenteeism very low.

33. A reward system based on skills and results.

34. Fear is driven out giving people the freedom to fail.

35. On-going development of all employees to reach their fullest potential.

36. All team members have access to all tools required to do the job as defined by team members.

Appendix C: Critical Path for Implementing
Self-Managing Work Teams

1. Site values drafted and minimum critical specifications
    set.

2. Charter design teams for products A and B and the
    distribution center.

3. Draft the work flow and analyze initial key variances.

4. Set the number, composition and type of process teams
    and set the process team reporting relationships.

5. Set the supplier/customer relationships.

6. Draft the inventory flow.

7. Complete scheduling of Minimum Critical specifications
    (MCS)--get detailed inventory and scheduling system.

8. Review critical path and natural work team production.

9. Adjust detailed variance analysis and structural
    design.

10-19. Reserved for future use.

20. Assessment policy complete.

21. Assessment center designed.

22. Assessment pre-test.

23. The actual assessment processing.

24-29. Reserved for future use.

30. Design team training and process management overview.

31. Training facilities injected into the physical plan.

32. State training funding proposal completed.

33. Process management training for design teams.

34. Reward system training for key staff.

35. Measurement systems training for key staff.

36. Just-In-Time (JIT) inventory, production management and scheduling training for key staff.

37. Design training for supervisors (including variance analysis).

38. Assessment training for supervisors.

39. Process management training for supervisors.

40. Quick start training for work teams.

41. Process management overview training for teams.

42. Team leader development for supervisors.

43. Total productive maintenance training.

44. Manufacturing continuous improvement training for supervisors.

45. Train-the-trainer in sociotechnical systems design/process and management/continuous improvement tools.

46. Manufacturing continuous improvement training for the teams.

47-49. Reserved for future use.

50. Specify information systems MCS.

51. MCS for the reward system detailed.

52. Define MCS for the support group (Quality Assurance, Human Resources, Manufacturing, Engineering, Maintenance, etc.).

53. Charter information systems design team.

54. Charter the reward design team and benchmark rewards.

55. Charter the support group design team.

56. Detail the common system boundary conditions.

57. Detailed explanation of the reward system (skill bases, gainsharing, salary).

58. Detail the measurement system.

59. Analysis of critical systems information requirements.

60. Validate the measurement system with senior teams and supervisors.

61. Detail the critical information systems design (six phase information engineering methodology).

62. Join the measurement and reward systems.

63. Integrate information systems and process (line prototyping).

64. Develop process measures around the key points.

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Vita

Captain Gerald L. Page was born on 31 January 1961 in Wichita, Kansas. He graduated from Campus High School in Haysville, Kansas in 1979. He then attended Wichita State University, from which he received a Bachelor of Science in Chemistry. He entered Officer Training School at Lackland AFB, Texas on 10 June 1985 where he received his reserve commission in the USAF. He served his first tour of duty as a Supply Officer at Carswell AFB, Texas working as Chief of the Operations Support and Materials Management Branches. Upon selection to captain, he also received a regular commission and was selected to attend the Air Force Institute of Technology, School of Systems and Logistics, in May 1989.

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13. ABSTRACT (Maximum 200 words) Many organizations today are continually trying to find ways to increase productivity and to decrease costs. As a result, many businesses are turning to Total Quality Management (TQM) as a means of achieving these goals. This research is a study of self-managing work teams, an aspect of TQM. A case study approach was chosen. The case study was not carried through to completion of the design effort due to time constraints. However, from the data gathered and knowledge gained from the literature review, it appears that the teams are already helping to increase productivity in the company studied. Significant factors in successful implementation of this concept include 1) full commitment and support from management, 2) good lines of communication between line workers, management, and the union, 3) union participation in the design process, 4) a solid organizational structure for the design team, and 5) proper education and training for the employees. Recommendations for further research include 1) carry this case study through to completion, 2) analyze the differences the teams made, and 3) conduct more longitudinal studies in this field. Keywords: Personnel management, Productivity, Theses.

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